



# **Landsat Applications for Cryosphere Research**

Snow and Ice are key both in terms of influencing climate and as indicators of climate change

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# Cryosphere Applications

- General
  - Change detection
  - Surface temperature mapping
  - Debris cover mapping cover (including geochemical composition of surface debris)
  - Melt pond detection (glaciers, ice sheets & sea ice)
  - Extent / terminus position mapping
  - Surface melt extent
- Small glaciers and ice caps
  - Glacier facies mapping
- Ice sheets
  - Ice stream and ice shelf monitoring
  - Iceberg calving and tracking
  - Feature tracking from image pairs
- Sea ice
  - Lead and polynya mapping
- Permafrost and frozen ground
- Snow
  - Snowmelt-runoff modeling to predict streamflow



# Key Attributes

- Long time series (since 1972)
  - For example, to develop CDRs for glaciers and snow-covered area
- High resolution (up to 15 m)
- Snow / cloud discrimination using 1.6 and 1.360-1.390 (cirrus)  $\mu\text{m}$  bands
- Higher signal to noise ratio for in visible bands
- High-resolution imagery for validation of medium- and coarse-resolution imagery (e.g., MODIS & VIIRS)
- Good radiometric calibration (e.g., for reflectance and surface temperature studies)

# Major Recommendations

- Increase the re-visit time, or launch two Landsats to achieve 8-day (or better) repeat coverage
- Commit to back-continuity with previous Landsats (for development of CDRs and change detection, etc.)